

Forward thinking supply chains

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SUPPLY CHAIN MANAGEMENT

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Managing in a Supply Constrained Environment

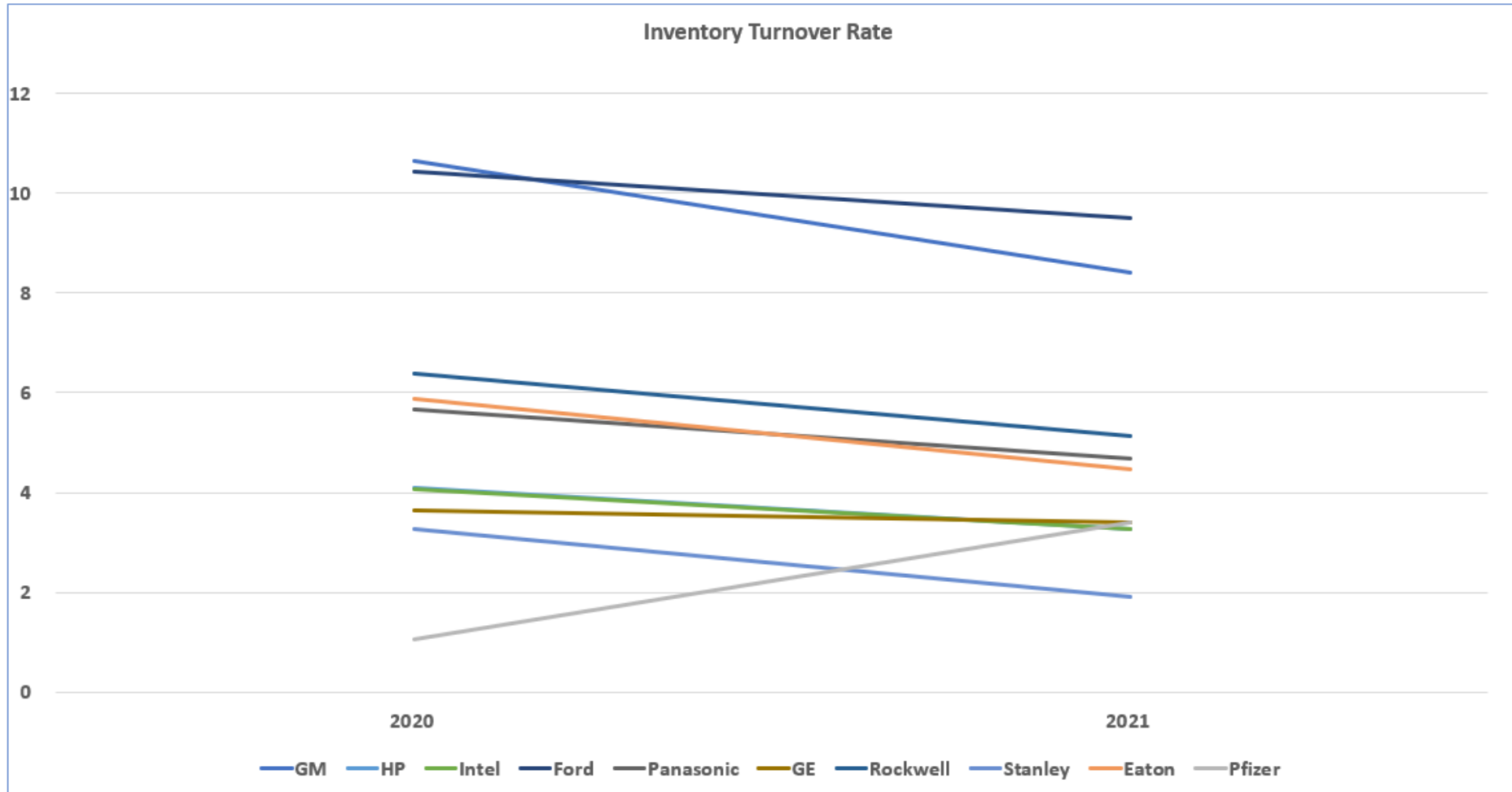
ERIK BUSH – CEO of DEMAND DRIVEN TECHNOLOGIES

AGENDA

- Context
- The Core Issue – An example
- Mitigating actions
- Recovery
- Conclusions

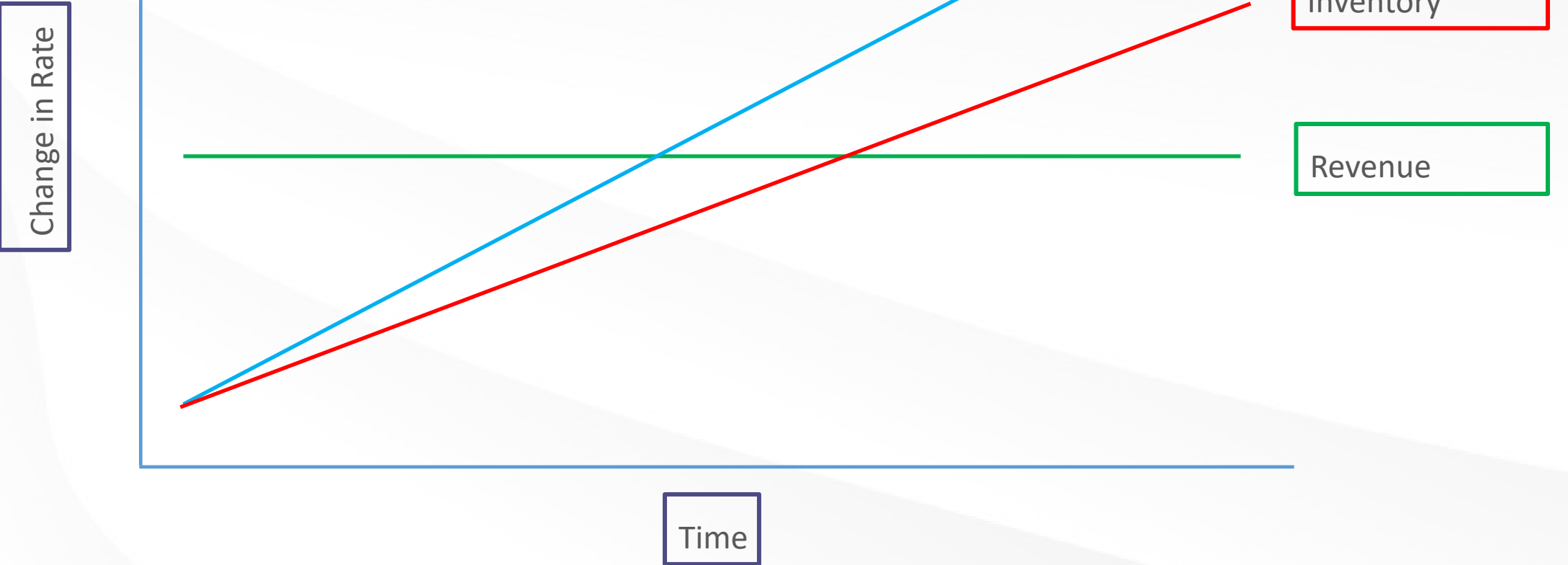


Inventory turnover trend - publicly traded manufacturers



	YTY
Stanley	-42%
Eaton	-24%
GM	-21%
HP	-20%
Rockwell	-20%
Intel	-20%
Panasonic	-17%
Ford	-9%
GE	-7%
Pfizer	222%

Impacts from constrained supply



The Constrained Supply Paradox



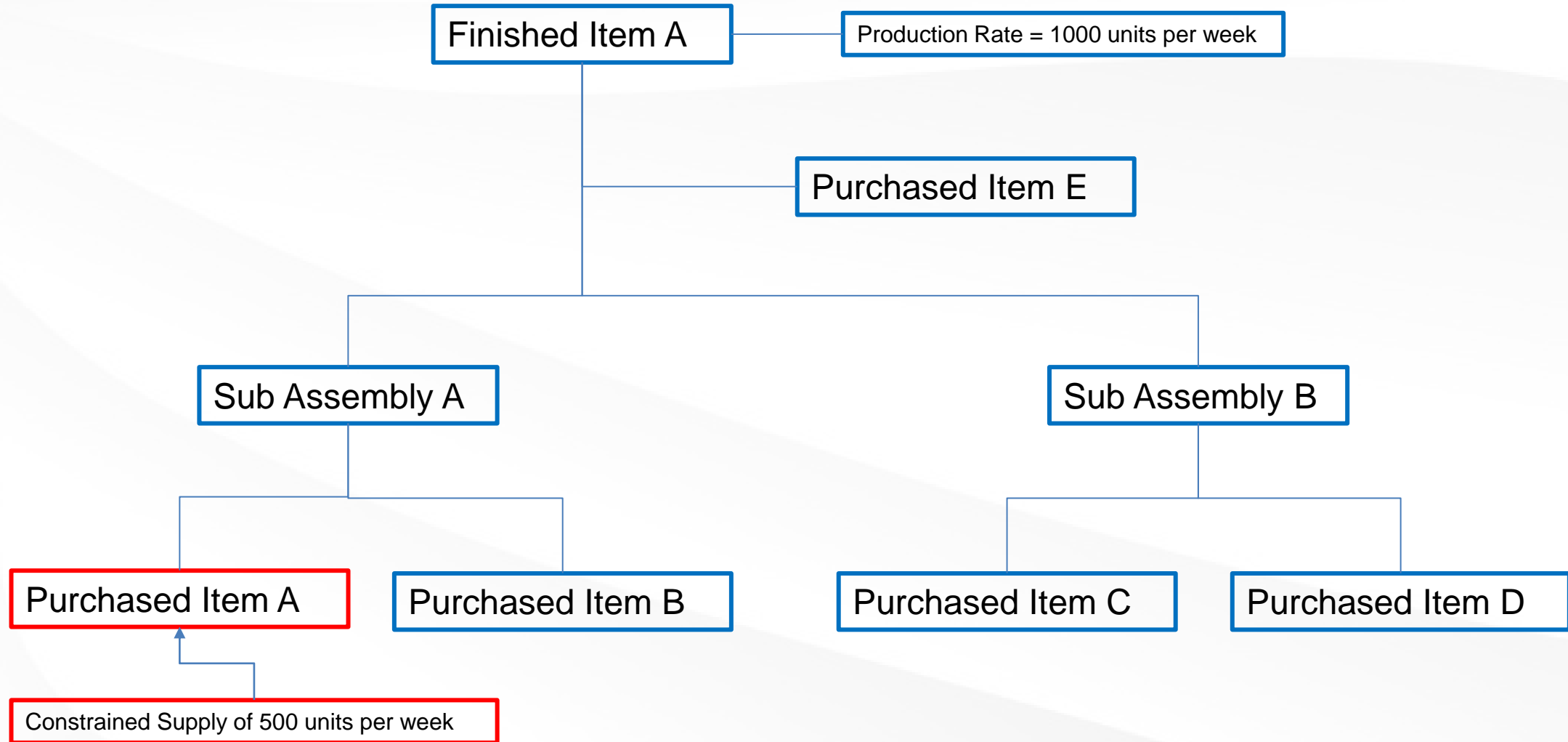
 Supply Is Constrained

And Yet

 Inventory Levels Are Increasing

 Inventory Turnover Rates Are Declining

An Example



Assumptions



- Market Demand for Finished Item A (FIA) of 1,000 per week
- Opening inventory of 2,000 units for FIA
 - Enables shipping within 24 hours to market demand
- Purchased Item A (PIA) has constrained supply of 500 units per week
- PIA has starting inventory of 0
- No constraints in effect on Purchased Items B – E

The Scenario



	Constrained Supply per Week	Starting Inventory Level	1	2	3	4	5	6	7	8	9	10
Market Demand			1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Purchase Item A supply	500	0	500	500	500	500	500	500	500	500	500	500
Back order demand of Purchase Item A			500	1000	1500	2000	2500	3000	3500	4000	4500	5000
Production shortfall			500	500	500	500	500	500	500	500	500	500
Finished Item A Inventory		2000	1500	1000	500	0	0	0	0	0	0	0
Backlog of Finished Item A Demand			500	1000	1500	2000	2500	3000	3500	4000	4500	5000
Response time to market			0	0	0	0	1	2	3	4	5	6

- Shortfall in production consumes inventory buffer for Finished Item A
- Accumulation of production shortfall creates backlog of past due demand
- Starting with week 5 we must increase our response time to the market!!!

Impact to Non-Constrained Purchased Items B - E



	Constrained Supply per Week	Starting Inventory Level	WEEK NUMBER										
			1	2	3	4	5	6	7	8	9	10	
Market Demand			1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Purchase Item A supply	500	0	500	500	500	500	500	500	500	500	500	500	500
Back order demand of Purchase Item A			500	1000	1500	2000	2500	3000	3500	4000	4500	5000	
Production shortfall to market demand			500	500	500	500	500	500	500	500	500	500	500
Finished Item A Inventory		2000	1500	1000	500	0	0	0	0	0	0	0	0
Backlog of Finished Item A Demand			500	1000	1500	2000	2500	3000	3500	4000	4500	5000	
Purchased Item B Supply Orders			1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Purchased Items B Consumption			500	500	500	500	500	500	500	500	500	500	500
Purchased Item B Inventory		1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	

The need for a constrained demand signal



- ❖ Purchased item inventory for non constrained items will accumulate if planned to an unconstrained demand signal
- ❖ Limiting the demand for unconstrained purchased items will reduce inventory build up

Lessons from Theory of Constraints



1. Identify the constraint!

- a. The resource which typically has the slowest rate of output in the plant

2. Finitely Schedule the constraint

- a. Ensure that you don't overload the constraint resource

3. Subordinate all other resources to the constraint

- a. Do not initiate other production activities that exceed the rate of the constraint
 - i. Limit levels of work in process inventory
 - ii. Limit use of production capacity to the rate of constrained supply

4. Elevate the performance of the constraint

- a. Any improvements in the rate of output of the constraint will improve the output of the entire plant

Impact of Constraining Orders for Purchased Items B - E



	Constrained Supply per Week	Starting Inventory Level	WEEK NUMBER										
			1	2	3	4	5	6	7	8	9	10	
Market Demand			1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Purchase Item A supply	500	0	500	500	500	500	500	500	500	500	500	500	500
Back order demand of Purchase Item A			500	1000	1500	2000	2500	3000	3500	4000	4500	5000	
Production output			500	500	500	500	500	500	500	500	500	500	500
Finished Item A Inventory		2000	1500	1000	500	0	0	0	0	0	0	0	0
Backlog of Finished Item A Demand			500	1000	1500	2000	2500	3000	3500	4000	4500	5000	
Purchased Item B Supply Orders			1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Purchased Items B Consumption			500	500	500	500	500	500	500	500	500	500	500
Purchased Item B Inventory		1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	
Purchased Item B Constrained Supply Orders			500	500	500	500	500	500	500	500	500	500	500
Purchased Items B Consumption			500	500	500	500	500	500	500	500	500	500	500
Purchased Item B Constrained Supply Inventory		1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Mitigating Actions



- Utilize a constrained Master Production Schedule limited to the pace of constrained materials
 - Will slow the pace of ordering of non constrained materials
- Elevate the performance of the constraint!!!
 - Identify additional/other vendors to address the shortfall
 - Offer a higher price to the vendor to get a higher supply rate
- Clean out past due demand
 - If your past due orders are more than 6 months old are they still valid?

The road to recovery



- What happens when the constrained item's supply is resolved?
- How long till we get back to normal?

Recovery to business as usual will take considerable time



	Constrained Supply per Week	Starting Inventory Level	10	Increased Supply	11	12	13	14	15	16	17	18	19	20
Market Demand			1000		1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Purchase Item A supply	500	0	500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Back order demand of Purchase Item A			5000		4500	4000	3500	3000	2500	2000	1500	1000	500	0
Production shortfall			500		-500	-500	-500	-500	-500	-500	-500	-500	-500	-500
Finished Item A Inventory		2000	0		0	0	0	0	0	0	500	1000	1500	2000
Backlog of Finished Item A Demand			5000		4500	4000	3500	3000	2500	2000	1500	1000	500	0
Response time to market			6		5	4	3	2	1	0	0	0	0	0
Purchased Item B Supply Orders			1000		1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Purchased Items B Consumption			500		1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Purchased Item B Inventory		1000	6000		5500	5000	4500	4000	3500	3000	2500	2000	1500	1000
Purchased Item B Constrained Supply Orders			500		1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Purchased Items B Consumption			500		1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Purchased Item B Constrained Supply Inventory		1000	1000		1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Recovery observations



- ◆ Even with a 3x improvement in constrained supply, the backlog of demand for FIA will take 10 weeks to recover
- ◆ Reduction in inventory of non-constrained items will take 10 weeks as well
- ◆ Recovery time will approximate the duration of the constrained period
 - ◆ And, new constraints are likely

Risk considerations



- ❖ Beware the risk of buying in excess of immediate need
- ❖ Build up of excess inventory utilizes working capital that may be better deployed to addressing constraints
- ❖ Excess inventory increases likelihood of obsolete inventory
- ❖ Other constraints will limit the rate of recovery

Floating constraints



- There is high likelihood of a new limitation emerging once the constrained supply item is resolved
 - Supply of other purchased items
 - Internal production limitations
- Ongoing diligence is required to ensure appropriate response to changing conditions

Conclusions



- Inventory turn rates are declining due to excess inventory in non-constrained items
- Use of a constrained MPS to drive planning will limit the build up of inventory in non constrained items
- Vendor collaboration is essential
- Be diligent and patient – this will take time to resolve

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Thank You!



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